European and African Reed Warblers, *Acrocephalus scirpaceus* and *A. baeticatus:* vocal and other evidence for a single species

by F. Dowsett-Lemaire and R. J. Dowsett

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It has long been known that the song of the African Reed Warbler *Acrocephalus baeticatus* – a grating, nasal chatter – is indistinguishable from that of the European Reed Warbler *A. scirpaceus*. The reports have come from many parts of Africa, covering populations of the 2 major forms *baeticatus* and *cinnamomeus* (*e.g.* Alexander 1899-1900, Lynes *in* Chapin 1953, Benson *in* Benson & Pitman 1956, Dowsett & Lemaire 1976, Schüz & Becker *in* Becker 1977). This vocal similarity has at times led to confusion, as when in 1971 J. Fairon thought he was collecting *A. scirpaceus* in Niger, whereas in fact the singing birds belonged to *baeticatus* (Devillers & Dowsett-Lemaire 1978). Similar examples of confusion come from Chad (Dowsett-Lemaire & Dowsett in press).

In our experience in south-central Africa, the only reliable field characters that can be used to separate African from European Reed Warblers are the smaller size and shorter, rounder wing of the African form. They overlap in general colouration (and both present a contrast between the more brightly-coloured ginger or rufous rump and the duller upperparts), and are very much alike in silhouette (especially the tapering profile of the head and long thin bill).

The present paper is part of a long-term study of the genus *Acrocephalus* (e.g. Lemaire 1977, Dowsett-Lemaire 1979a, 1981a). We first review the rather complex taxonomic reshuffles that *A. baeticatus* has been through since Hall & Moreau (1970) allied it to *A. scirpaceus*. We then present descriptive as well as experimental evidence of the similarity in vocalizations, a summary of habitats used in Africa, and suggestions of areas of research into the possible interactions of *baeticatus* and *scirpaceus*.

Material and methods

All tape recordings were made using an Uher 4000-L machine at a speed of 19 cm/sec, and a semi-directional microphone (Beyer M69) at the centre of a parabolic reflector of 75 cm diameter. Tapes were analysed with a Kay Electric Co. Sonograph (model 7029A). In playback experiments, tapes were played on the edge of occupied territories, either through a loudspeaker – connected by a cable to the recorder 15 m distant – or directly from the recorder. Experiments combining 2 song types presented 1 min of either song, followed by an interval of at least 5 min, then 1 min of the other song; in the case of *A. dumetorum* where the song is discontinuous, the tape was played for 2 min.

Taxonomic and geographical background

A. scirpaceus

Vaurie (1959) and others have recognized 2 races of *A. scirpaceus:*

A.s. scirpaceus (Hermann 1804) and *A.s. fuscus* (Hemprich & Ehrenberg 1833). Both winter entirely within the Afrotropical region, and their distribution and ecology there are detailed by Dowsett-Lemaire & Dowsett (in press).

A. baeticatus and *A.(b.) cinnamomeus*

White (1960) recognized 4 races of *A. baeticatus (sensu lato)*, considering *suahelicus* to be a synonym of nominate *baeticatus*. Subsequently 3 more races have been described, and the type localities and authors of all 8 are given in Table 1. It should be noted that the type locality of

TABLE 1

The subspecies of *Acrocephalus baeticatus (sensu lato)*

Subspecies	Author	Type locality
baeticatus-group		
baeticatus	(Vieillot 1817)	South Africa (Knysna, S. Cape)
suahelicus	Grote 1926	Tanzania (Zanzibar Is.)
hallae	White 1960	Namibia/S.W. Africa (Brandberg)
cinnamomeus-group		
cinnamomeus	Reichenow 1908	Zaire-Uganda (N. end of L. Edward)
nyong	Bannerman 1936	Cameroon (Akonolinga, Nyong R.)
hopsoni	Fry, Williamson & Ferguson-Lees 1974	Nigeria (Malamfatori, L. Chad)
fraterculus	Clancey 1975	Moçambique (Bela Vista, Maputo)
guiersi	Colston & Morel 1984	Senegal (L. Guier, Richard-Toll)

cinnamomeus has been quoted variously as Lake Edward or Lake Albert (*e.g.* Chapin 1953: 457, White 1960); its original citation is Lake Albert Edward, which as Chapin (1954: 640) pointed out is synonymous with Lake Edward.

The recognition of 2 species within *A. baeticatus (s.l.)*, following Clancey (1975), would mean allocation of the first 3 races in Table 1 to *A. baeticatus*, and the second 5 to *A. cinnamomeus*. As presently known, the distribution of the former group is mostly continuous, whereas *cinnamomeus* appears to be present as a series of isolates (Clancey 1975). Some populations, at least of *A. baeticatus (sensu stricto)*, appear to be migratory, while breeding birds of both it and *cinnamomeus* occur alongside migrant *A. scirpaceus* for part of the year.

Clancey's (1975) separation of *A. baeticatus* into 2 species is based on 2 conclusions: (1) that southern Zambian birds are the same race, *A.b. suahelicus*, as found in mangroves of coastal eastern Africa, and (2) are separated by a second, smaller species *A. cinnamomeus*. The first conclusion seems rather unlikely on geographical grounds, and is besides based on very few specimens. The second conclusion appears to be based on the measurements of only 8 specimens from the intervening area, from 8 different localities; these are attributed to *A. cinnamomeus fraterculus*.

Clancey recognizes *A. cinnamomeus* as a species on differences of wing and tail length only, as he finds colouration of little use, and "examination of the wing-formulae of the two species reveals no trenchant difference" (Clancey 1975: 4). The breeding status of these specimens is not considered, nor are song and other characters.

TABLE 2

Two populations of *Acrocephalus baeticatus* measured in southern Zambia

Population	Dates	n	Wing[1] mean	Wing[1] range	Weight[2] mean	Weight[2] range
A	26 Nov – 1 Apr	10	57.5±1.97	55–61	10.1±1.56	7.9–12.8
B	14 Aug – 8 Sep	6	61.6±2.38	58–65	11.1±1.32	9.7–13.5

[1] Wing measurement maximum chord (mm), mean ±S.D.
[2] Weight (g), mean ±S.D.

In southern Zambia alone, 2 populations of *A. baeticatus* can be distinguished on the basis of size (Table 2), the longer-winged birds (B) being non-breeding winter visitors, the shorter-winged (A) the local summer breeders. Our sample is small, but the difference appears statistically significant ($d=3.48$, $P<0.01$). This suggests that the measurements of Clancey's samples should be interpreted with caution until more is known of the status of various populations and larger series are examined. The decrease in wing length northwards in southern Africa might be clinal (and related to migratory patterns); even if this is not the case, small differences in wing and tail length when all other characters are equal are likely to be of no more than subspecific importance.

A. baeticatus and *A. dumetorum*

Fry *et al.* (1974) have similarly used characters of wing morphology, this time wing formulae, to ally *A. baeticatus* with the Palaearctic Blyth's Reed Warbler *A. dumetorum*. This lumping is surprising, and contrary to some other characters mentioned briefly by the authors, to which can be added voice – widely recognized as being of overall importance in species-isolating mechanisms among siblings (many references, *e.g.* Thorpe 1961). In fact in general appearance, colour, breeding habitat and habits *A. dumetorum* is much more closely related to the European Marsh Warbler *A. palustris* (Eriksson 1969, Williamson 1974, Koskimies 1980), with which it has in fact been reported to hybridise – perhaps not infrequently, as Koskimies (1980) found 3 mixed pairs in one small area of Finland in 1979. The song of *dumetorum* is very distinctive and quite unrelated to that of reed warblers *s.l.*: as in *A. palustris*, it is richly imitative, but discontinuous, louder and more repetitive, consisting of separate melodious phrases delivered in a slow tempo (e.g. Boswall 1968, Palmér & Boswall 1972). Moreover, all populations of *dumetorum* winter in or near the Indian subcontinent (Vaurie 1959), those which breed in eastern Europe migrating southeastwards. Such a migration pattern would be most unexpected if the origins of *dumetorum* did indeed include a close relationship to any Afrotropical form.

Vocalizations

In European *Acrocephalus* warblers the song is highly species-specific, and is often the best field character used in distinguishing the closely similar and plain-plumaged members of the genus. For example, the song of *A. palustris* (a close relative of *A. scirpaceus*) is very different in many of its aspects, e.g. tempo, timbre and the nature of the motifs, which are

essentially extraspecific imitations (Dowsett-Lemaire 1979a, 1981b).

A. scirpaceus

The song of *A. scirpaceus* is a slow, distinctively nasal chatter, consisting of short, softly grating phrases, directly juxtaposed or sometimes linked by 1-2 fluid notes. It is delivered more or less continuously by unmated males, which may sing for several minutes without interruption, or even a few hours with occasional breaks of no more than a few seconds. A typical sequence may be rendered as "chirruc-chirruc-chirruc-puipuipui-trer-trer-trer-tjetje-tjetje", and the main frequency range is 1.5 – 6.5 kHz (see Fig. 1, also Heuwinkel 1978).

One of the most frequent types of phrase consists of nasal elements (with several harmonic overtones), grouped into twos and repeated 2-5 times; there are clear examples of this in Fig. 1A (phrase a) and 1D (phrase c). Grating notes, with a structure resembling that of the churring alarm calls, are also characteristic (see Fig. 1C, phrase b). Brief imitations of other species' calls are sometimes uttered, but are never more than occasional. Males continue to sing after pairing, but for a much smaller proportion of the time (Catchpole 1973). More or less subdued song is often heard in the winter quarters (Dowsett-Lemaire & Dowsett in press).

A. baeticatus (including the form *cinnamomeus*)

The spectrographic comparison of recorded songs of *A. scirpaceus* to *A. baeticatus* and *cinnamomeus* confirms the observations on song similarity made by earlier ornithologists. Tapes are now available from the breeding grounds of *cinnamomeus* in Senegal (recording by G. J. Morel, with one of the singers collected), and of *baeticatus* in Zambia (F. D.-L., published in part by Chappuis 1978), Zimbabwe (A. Walker *in* Chappuis 1978) and Natal, South Africa (F. D.-L., unpubl.). The identity of our Zambian and South African samples was confirmed by capture. From 1-2 minutes of full song of all 3 forms have been analysed spectrographically, and selected results are shown in Fig. 1.

This preliminary examination shows no significant differences in pitch, tempo, syntax or structure of notes in the songs of all 3 forms. The characteristic double, nasal elements of *scirpaceus* "chirruc-chirruc-chirruc" are also frequent in *cinnamomeus* (compare phrase d of Fig. 1E and e of 1G to the corresponding motifs in Fig. 1D (c) and 1A (a) respectively) and *baeticatus* (phrase g in Fig. 1I and h in Fig. 1J). The grated notes (b) of *scirpaceus* in Fig. 1C have their equivalents in the other forms, e.g. *baeticatus* in Fig. 1I (phrase f).

That such similarity is found in the repertoires of widely separated populations is striking. Study of the full repertoires of *scirpaceus* requires between 5 and 10 minutes of continuous song to be spectrographed (C. K. Catchpole, C. Keulen). Such time-consuming analysis could not be attempted here, but would be useful in revealing the extent of inter-individual and intra-population variation.

Chappuis (1978) suggested the existence of another song type in *baeticatus*, but this was in reference to a recording by Stannard & Niven (1966) subsequently shown to be a misidentification of the juvenile song of *A. palustris* (Dowsett-Lemaire 1981b). Chappuis's comment that

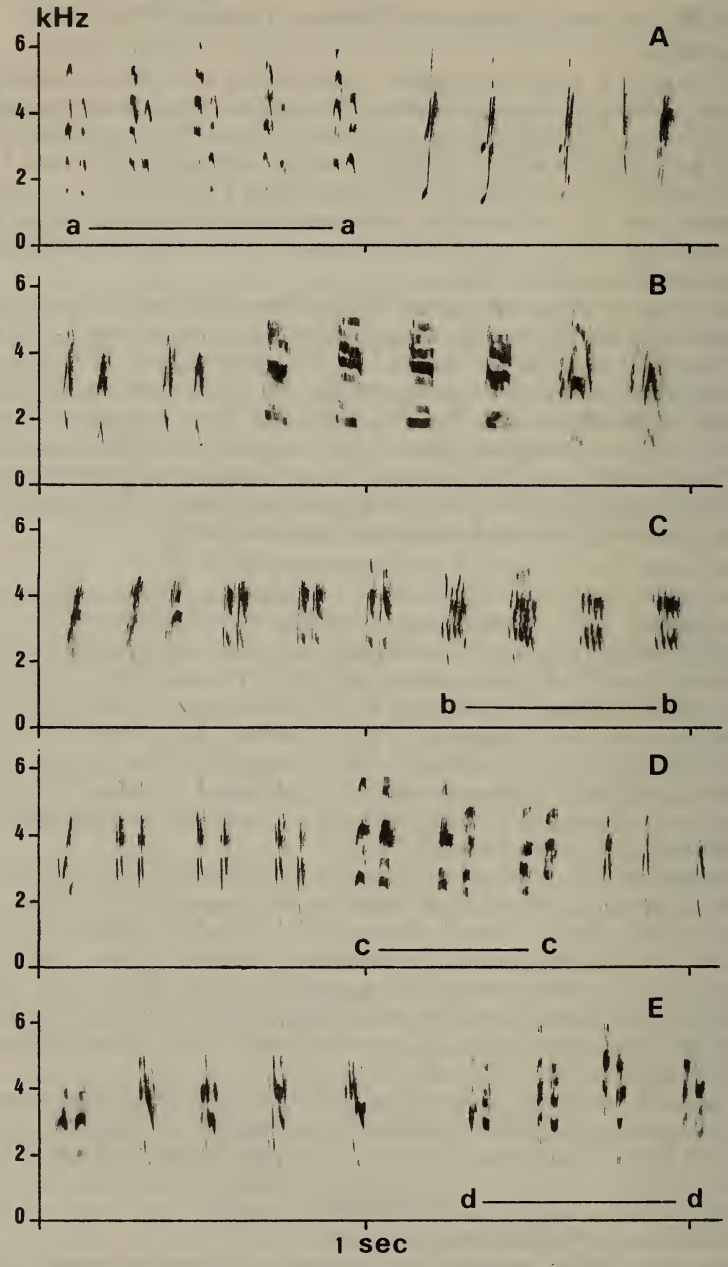
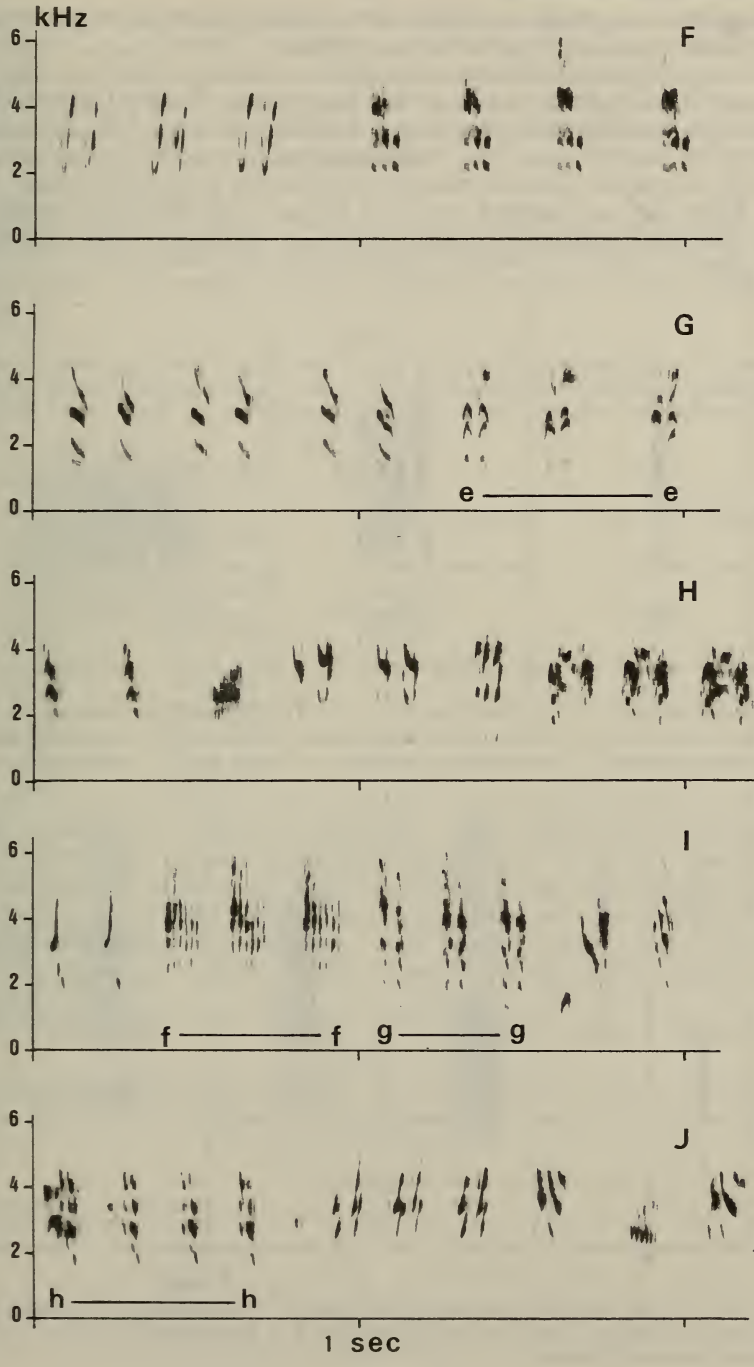


Figure 1. Sound spectrograms illustrating fragments of song of:– A–D. European Reed Warbler *Acrocephalus scirpaceus* (recorded in Belgium); E–G. African Reed Warbler *A. baeticatus*, form *cinnamomeus* (recorded in Senegal, by G. J. Morel); and H–J. form *baeticatus* (recorded in Zambia). Phrases discussed in the text are labelled a, b etc.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baeticatus song might be slightly lower-pitched than that of *scirpaceus* is not borne out by comparison of sonograms.

As in *scirpaceus*, *baeticatus* continues to sing after pairing, with a decrease in the frequency and length of song phrases. Subdued song has been heard in moulting birds wintering in Zambia (pers. obs.; P. B. Taylor); the song can become quite loud at the end of moult, and by September some males in southern Zambia reacted strongly to the playback of a tape.

When they are alarmed, the most frequent call-notes in *A. scirpaceus*, *A. baeticatus* and also *A. palustris* are sharp, clicking "tec, tec" noises and

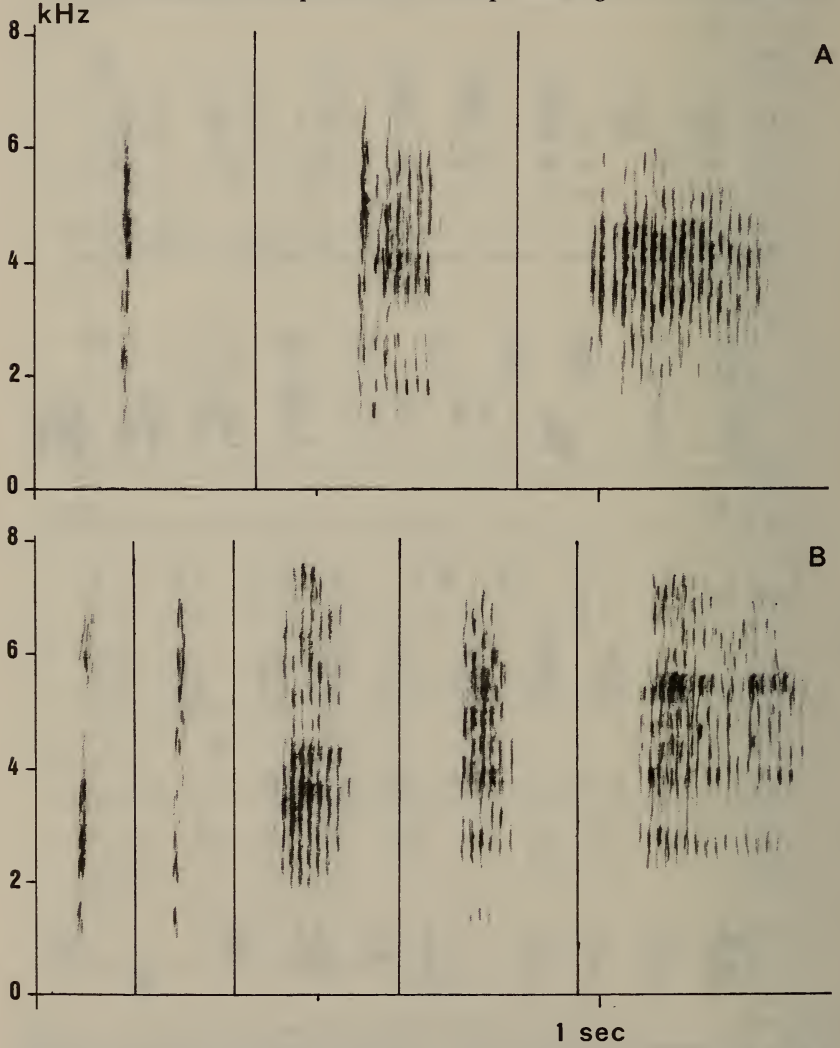

Figure 2. Sound spectrograms showing alarm calls of:– A. *Acrocephalus scirpaceus* (1 "tec" followed by 2 types of rattle, recorded in Belgium), B. *A. baeticatus* (2 "tec", then 2 types of rattle, recorded in Zambia).

"krrrt" rattles of varying length. As studied in detail in *A. palustris* (Dowsett-Lemaire 1979b), there is much individual variation in the length and structure of these calls, and from the material available for *scirpaceus* and *baeticatus* (Fig. 2) it is not possible to detect significant differences between them so far, though in some situations the calls of *baeticatus* have sounded less nasal than those of *scirpaceus*.

Playback experiments

Vocal similarities between *A. scirpaceus*, *baeticatus* and *cinnamomeus* are further evidenced by the results of tape playback experiments. In all, 40 reed warblers were tested with the playback of tapes of various origins (Table 3).

TABLE 3

Playback experiments (Nos 1–6) of the song of reed warblers (*Acrocephalus scirpaceus*, *baeticatus* and *cinnamomeus*, *sensu* Clancey 1975), European Marsh Warbler *A. palustris*, and Blyth's Reed Warbler *A. dumentorum*, presented to territorial male reed warblers in Europe and Africa.

No.	Bird tested	Place, date	Tape used	Origin
1.	*A. scirpaceus* (n=10)	Belgium, May 1976	*baeticatus* & *scirpaceus*	Zambia, Belgium
2.	*A. baeticatus* (n=5)	Zambia, March 1977	*scirpaceus* & *baeticatus*	Belgium, Zambia
3.	*A. scirpaceus* (n=5)	Belgium, May 1985	*cinnamomeus*	Senegal
4.	*A. baeticatus* (n=6)	South Africa, Nov 1985	*cinnamomeus* & *scirpaceus*	Senegal, Belgium
5.	*A. baeticatus* (n=6)	South Africa, Nov 1985	*cinnamomeus* & *palustris*	Senegal, Belgium
6.	*A. baeticatus* (n=8)	South Africa, Sept 1986	*scirpaceus* & *dumetorum*	Belgium, Finland

All tapes of *A. scirpaceus*, *baeticatus* and *cinnamomeus* provoked strongly positive reactions in territorial males (with movements towards the loudspeaker or recorder, searching behaviour and loud song). Mist-netting was occasionally undertaken in conjunction with tape playback: in Zambia a *scirpaceus* tape attracted 2 male *baeticatus* into a net, while in Belgium a tape of *cinnamomeus* from Senegal enabled 2 male *scirpaceus* to be caught.

The control tapes of *A. dumetorum* (Table 4) and *A. palustris* elicited no

TABLE 4

Time spent within 1 m of the speaker by 10 *A. scirpaceus* (Belgium, exp. 1) and 8 *A. baeticatus* (South Africa, exp. 6) submitted to playback songs of *A. baeticatus*, *scirpaceus* and *dumetorum* in their territories.

Species tested	Tape used	Time (sec) spent near speaker by individuals 1	2	3	4	5	6	7	8	9	10
A. scirpaceus	*A. baeticatus*	35	60	15	62	70	64	42	30	16	75
	A. scirpaceus	45	60	12	60	30	62	60	10	15	40
A. baeticatus	*A. scirpaceus*	80	35	90	55	43	60	42	15		
	A. dumetorum	0	0	0	0	0	0	0	0		

response (see also Lemaire 1977 for experiments with *A. palustris* and *A. scirpaceus*). With reed warbler tapes, there was much inter-individual variation in the length and type of response, depending for instance on whether or not the male tested was paired. In experiments combining *baeticatus/scirpaceus* or *cinnamomeus/scirpaceus* the same birds, however, approached the source of sound in much the same way on hearing either tape, but were often quicker to react during the second playback. In similar experiments with European *Acrocephalus* warblers, Catchpole & Leisler (1986) recommended the most useful measure of aggressive response as the time spent by a bird within 1 m of the speaker. This was measured in experiments 1 and 6 (where the tape was played through a speaker 10-15 m away from the observer), and results are shown in Table 4. Mean response times for the *baeticatus* tape were 46.9±13.8 sec and 39.4±13.3 sec for *scirpaceus:* the difference is not significant.

Habitats used by *A. baeticatus* and *scirpaceus*

In Senegal *A. baeticatus* is known to breed in reedbeds dominated by *Typha* (G. J. Morel). In southern Zambia we found nest-building and feeding birds in seasonal floodplains where *Cyperus* was dominant. Elsewhere in southern Africa *baeticatus* occupies quite a variety of wet or moist habitats: the edges of *Phragmites* reedbeds (leaving the extensive, more deeply-flooded reeds to the larger and stronger-legged Lesser Swamp Warbler *A. gracilirostris*); extensive beds of thin-stemmed *Cyperus* (5-7 mm in section) mixed with *Typha* and pockets of *Phragmites; Typha* and scrub (*Convolvulus* creepers, *Solanum mauritianum*) over mud; tufts of vertical-stemmed grass *Panicum maximum* on river banks; thin reeds and scrub (*Acacia karroo, Rumex, Salix*) also on riverbanks. *A. baeticatus* occasionally settles in slightly moist thickets far away from water (with, e.g., thin *Phragmites, Scirpus, Asparagus* thicket and *Rhus* scrub).

The 5 nests F. D.-L. has examined were attached to 4-6 vertical stems (with occasionally 1-2 oblique) of *Cyperus* (2), *Typha* (2) and *Panicum maximum* (1) in the fashion typical of reed warblers, and at a height of 0.6-1.5 m. The nests themselves of *baeticatus* are like those of *scirpaceus,* especially in being deep-cupped, and similar to a Senegal nest of *cinnamomeus* figured by Fry *et al.* (1974). *A. baeticatus* were seen to feed in dry herbaceous growth and low trees outside their defended territories, as well as in marshland.

In most parts of South Africa (such as the Cape), *A. baeticatus* is a summer breeding visitor: this means that some populations undergo movements to the north which are likely to be of at least 1000-2000 km. Birds wintering near Livingstone in southern Zambia (from July or earlier to September) fed in dry riverside thickets of *Acacia, Lantana, Rhus* etc. with some tall grass and small *Phragmites* beds at the edges. This was exactly where *A. scirpaceus* had been located in the summer rains. Similarly in northern Zambia at Ndola, P. B. Taylor observed and mist-netted non-breeding *baeticatus* in small deciduous and evergreen thickets with tall grass and *Typha* at the edge of a swamp, in the months of May and September to November. This was a regular site for wintering *scirpaceus,*

mostly from November to April, with the 2 thus overlapping in November.

Much of the breeding habitat of *baeticatus* in southern Africa dries out in the winter; those *baeticatus* wintering in Zambia do so in drier habitats, from which they are absent in the breeding season. The range of breeding and non-breeding habitats of *scirpaceus* – with a similar shift to drier situations after breeding – has been reviewed elsewhere (Dowsett-Lemaire & Dowsett in press; see also Leisler 1981). Clearly African and European Reed Warblers are very close in their ecological requirements and general habits.

Areas of further research

At this stage of our knowledge, 2 particular problems need further investigation. One is the analysis of full repertoires of African and European songs of Reed Warblers in order to establish inter-population variation (see above). The other should be examination of the behavioural and ecological interactions of *baeticatus* and *scirpaceus* in some areas of contact. South of the equator, close contact is likely to be limited, as wintering *scirpaceus* is generally found away from the marshland in which *baeticatus* breeds. Moreover, *scirpaceus* becomes very rare south of 15°S.

A. scirpaceus is widespread in winter in central and West Africa (Dowsett-Lemaire & Dowsett in press), but the status of *baeticatus* in much of that area needs clarification. The populations of *baeticatus* in the northern tropics are not as widely scattered as claimed by Colston & Morel (1984), who overlooked the facts that Lamarche (1981) reports them in Mali (under the name of *cinnamomeus*) as widespread and breeding south of 17°N, with large numbers in the inland Niger delta, and that Devillers & Dowsett-Lemaire (1978) describe specimens collected in Niger. Recently, Wilkinson & Aidley (1983) have discovered another population in northern Nigeria. *A. scirpaceus* winters north to about 16°N (map in Dowsett-Lemaire & Dowsett in press), and the northernmost localities of *baeticatus* are from the Tibesti in Chad, c. 21°21′N, 16°56′E (Fry *et al.* 1974) and Arrigui in Niger, 19°06′N, 12°55′E (Devillers & Dowsett-Lemaire 1978).

The Sahel Region could be the best general area in which to study interactions between *scirpaceus* and *baeticatus*. *A. scirpaceus* winters there during the dry season, and its typical non-breeding habitat of rank grass and leafy thickets is not widely available then. In Mali and northern Nigeria European Reed Warblers are reported from *Typha* beds and scrub on riverbanks, in cohabitation with African Reed Warblers (Lamarche 1981, Wilkinson & Aidley 1983). In Senegal also, some European birds occur with *baeticatus* in wet *Typha* beds (G. J. Morel). In Senegal and Gambia, African Reed Warblers breed in the summer rains in June (G. J. Morel) and July (Cawkell & Moreau 1963). One can expect *baeticatus* to be strongly territorial and vocal by at least the month of May (when indeed G. J. Morel tape recorded full songs), at a time when *scirpaceus* migrants are common. Moreover, some *scirpaceus* are present during June in Senegal, with 5 caught as late as 25-30 June (G. J. & M.-Y. Morel). The possibility of *baeticatus-scirpaceus* interbreeding cannot be excluded. So far,

A. scirpaceus is not known to breed south of c. 30°N in northwestern Africa (Heim de Balsac & Mayaud 1962).

Conclusion

Only in its more rounded wing does *A. baeticatus* differ greatly from *scirpaceus*, and this is probably no more than an adaptive character. In southern Africa the races of *A. baeticatus* with the longest wings, the nominate and *hallae*, are known to be migratory (Clancey 1975). In the northern tropics Fry & Ferguson-Lees (1977) comment on an increase in wing length away from the equator, and at least some of the northerly, long-winged populations appear to be seasonal migrants (Fry *et al.* 1974).

The only definite case of hybridisation between *A. scirpaceus* and the largely sympatric *A. palustris* involved a male *scirpaceus* with an aberrant mixed *palustris-scirpaceus* song (Lemaire 1977, Helb *et al.* 1985): this suggests that, once the vocal barriers are broken down, small though significant differences in plumage characters (in size, colour, wing formulae, bill length and shape) fail to maintain specific separation. With the exception of size, the European and African Reed Warblers are much more similar in plumage than either is to *A. palustris* (*e.g.* Williamson 1974, Dowsett-Lemaire & Dowsett 1979), and they have similar ecological requirements and habits. Above all, their territorial songs sound identical and the birds themselves react strongly to both European and African repertoires. It is therefore a logical conclusion that *A. scirpaceus* and *baeticatus* (including *cinnamomeus*) are still components of but one species, for which the earlier name is *A. scirpaceus*. It seems likely that their breeding ranges have become separated as the Sahara desert has extended. The recognition of both Palaearctic and Afrotropical populations of one species is not without precedent, examples being the Black and the Yellow-billed Kites *Milvus migrans migrans* and *M.m. parasitus*.

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Address: F. Dowsett-Lemaire and R. J. Dowsett, Rue de Bois-de-Breux 194, B-4500 Jupille-Liège, Belgium.